IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of the claims in the application.

1. (Previously Presented) Spectral interferometry apparatus, comprising an interferometer adapted to be excited by an optical source, the apparatus comprising:

object optics arranged to transfer a beam from the optical source to a target object, and to produce an object beam from the target object;

reference optics arranged to produce a reference beam;

displacing means arranged to displace at least one of the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam;

wherein there is an optical path difference between the relatively displaced object beam and the relatively displaced reference beam generated in the interferometer; and

optical spectrum dispersing means arranged to receive the relatively displaced object beam and the relatively displaced reference beam on different portions of the optical spectrum dispersing means due to lateral displacement of the two relatively displaced beams caused by the displacing means, and arranged to disperse the spectral content of the two displaced beams onto a reading element such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein in use the combination of the displacing means and the optical spectrum dispersing means is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the reading element; and

wherein the displacing means is adapted to relatively displace the object beam and the reference beam to produce the relatively displaced object beam and the relatively displaced reference beam using one or a combination of reflection, deflection, or refraction of at least one of the object beam and the reference beam.

2. (Previously Presented) Spectral interferometry apparatus according to claim 1,

wherein the displacing means comprises at least two reflective elements, one of said at least two reflective elements being arranged to reflect the object beam and another of said at least two reflective elements being arranged to reflect the reference beam.

3. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the displacing means comprises at least one acoustic-optic modulator.

4. (Previously Presented) Spectral interferometry apparatus, comprising an interferometer adapted to be excited by an optical source, the apparatus comprising:

object optics arranged to transfer a beam from the optical source to a target object, and to produce an object beam from the target object;

reference optics arranged to produce a reference beam;

displacing means arranged to displace at least one of the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam;

wherein there is an optical path difference between the relatively displaced object beam and the relatively displaced reference beam generated in the interferometer; and

optical spectrum dispersing means arranged to receive the relatively displaced object beam and the relatively displaced reference beam on different portions of the optical spectrum dispersing means due to lateral displacement of the two relatively displaced beams caused by the displacing means, and arranged to disperse the spectral content of the two displaced beams onto a reading element such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein in use the combination of the displacing means and the optical spectrum dispersing means is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the reading element; and

wherein the object optics includes object fiber optics comprising an object fiber end arranged to transmit the object beam and the reference optics includes reference fiber optics comprising a reference fiber end arranged to transmit the reference beam and the displacing

means is arranged to move the relative positions of the object fiber end and the reference fiber end in order to produce the relatively displaced object beam and the relatively displaced reference beam.

5. (Previously Presented) Spectral interferometry apparatus according to claim 4, wherein the displacing means is further arranged to produce the relatively displaced object beam and the relatively displaced reference beam by a combination of moving the relative positions of the object fiber end and the reference fiber end and any one or combination of reflection, deflection, and refraction.

6. (Previously Presented) Spectral interferometry apparatus, comprising an interferometer adapted to be excited by an optical source, the apparatus comprising:

object optics arranged to transfer a beam from the optical source to a target object, and to produce an object beam from the target object;

reference optics arranged to produce a reference beam;

displacing means arranged to displace at least one of the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam;

wherein there is an optical path difference between the relatively displaced object beam and the relatively displaced reference beam generated in the interferometer; and

optical spectrum dispersing means arranged to receive the relatively displaced object beam and the relatively displaced reference beam on different portions of the optical spectrum dispersing means due to lateral displacement of the two relatively displaced beams caused by the displacing means, and arranged to disperse the spectral content of the two displaced beams onto a reading element such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein in use the combination of the displacing means and the optical spectrum dispersing means is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the reading element; and

wherein one of the object optics or the reference optics includes fiber optics comprising a fiber end arranged to transmit a respective one of the object beam or the reference beam, and the displacing means is arranged to produce the relatively displaced object beam and the relatively displaced reference beam by movement of the fiber end.

7. (Previously Presented) Spectral interferometry apparatus according to claim 6, wherein the displacing means is further arranged to produce the relatively displaced object beam and the relatively displaced reference beam by a combination of moving the fiber end and any one or combination of reflection, deflection, and refraction.

8. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the displacing means is adapted to alter the diameters of at least one of the object beam and the reference beam.

9. (Previously Presented) Spectral interferometry apparatus according to claim 1, further comprising means arranged to control the optical path difference in the interferometer.

10. (Previously Presented) Spectral interferometry apparatus according to claim 1, further comprising means arranged to control the intrinsic optical delay between the relatively displaced object beam and the relatively displaced reference beam.

11. (Previously Presented) Spectral interferometry apparatus according to claim 10, wherein the means arranged to control the optical path difference in the interferometer and the intrinsic optical delay comprises processing means.

12. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the reading element is arranged to provide a signal to a signal analyser, the signal analyser being arranged to determine the distribution of reflections or scattering points in a depth range within the target object.

13. (Previously Presented) Spectral interferometry apparatus according to claim 12, wherein the apparatus is arranged to adjust the depth range by adjusting the diameter of at least one of the relatively displaced object beam and the relatively displaced reference beam.

14. (Previously Presented) Spectral interferometry apparatus according to claim 1, further comprising means to match the polarization of the relatively displaced object beam and the relatively displaced reference beam with that of the optical dispersing means.

15. (Previously Presented) Spectral interferometry apparatus according to claim 1, further comprising means to compensate for dispersion in the interferometer.

16. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the displacing means is adapted to relatively orient the relatively displaced object beam and the relatively displaced reference beam in a displacement plane.

17. (Previously Presented) Spectral interferometry apparatus according to claim 16, wherein the displacing means is adapted to permit adjustment of the relatively displaced object beam and the relatively displaced reference beam until they become parallel in the displacement plane.

18. (Previously Presented) Spectral interferometry apparatus according to claim 16, wherein the displacement means is arranged to permit an adjustable lateral superposition of the two relatively displaced beams in the displacement plane onto the optical spectrum dispersing means in order to enhance the strength of the signal for small optical path difference values, wherein the lateral superposition is from partial superposition to a total overlap.

19. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the displacing means is adapted to relatively orient the relatively displaced object beam and the relatively displaced reference beam such that they hit different portions of the optical spectrum dispersing means.

20. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the optical spectrum dispersing means comprises any one of or combination of: a diffraction grating, a prism; a group of prisms; a group of diffraction gratings.

21. (Previously Presented) Spectral interferometry apparatus according to claim 20, wherein the optical spectrum dispersing means comprises a diffraction grating, wherein grating lines of the diffraction grating are perpendicular to a line connecting the centre of the relatively displaced reference beam and the centre of the relatively displaced object beam.

22. (Previously Presented) Spectral interferometry apparatus according to claim 20, wherein the optical spectrum dispersing means comprises a prism including an entrance surface, wherein a line connecting the centre of the relatively displaced reference beam and the centre of the displaced object beam, is within the plane defined by the normal to the entrance surface of this prism and its bisectrix.

23. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the reference optics comprises at least one reflector arranged to provide a reference light source by reflecting a beam of the optical source, wherein the position or tilt of the reflector can be adjusted in order to control the optical path difference of the relatively displaced object beam and the relatively displaced reference beam.

24. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the reference optics is arranged to transfer an optical beam from the optical source to the displacing means along via fiber optics or via reflectors arranged to prevent light form being sent back to the optical source.

25. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the object optics comprises a first zoom element arranged to alter the diameter of the object beam.

26. (Previously Presented) Spectral interferometry apparatus according to claim 1, further comprising a third zoom element arranged to alter the diameter of the relatively displaced object beam.

27. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the reference optics comprises a second zoom element arranged to alter the diameter of the reference beam.

28. (Previously Presented) Spectral interferometry apparatus according to claim 1, further comprising a fourth zoom element arranged to alter the diameter of the relatively displaced reference beam.

29. (Previously Presented) Spectral interferometry apparatus according to Previously Presented, wherein the displacement means is arranged to create an adjustable gap between the two relatively displaced beams in order to adjust the minimum optical path difference value for which a modulation of the optical spectrum could be sensed at the reading element.

30. (Previously Presented) Spectral interferometry apparatus according to claim 29, wherein interference between the two relatively displaced beams in the interferometer takes place entirely on the said reading element.

31. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein interference between the two relatively displaced beams is arranged to take place partially on the said reading element and partially on the said optical spectrum dispersing means.

32. (Previously Presented) Spectral interferometry apparatus according to claim 31, wherein the displacing means is arranged to adjust the amount of lateral superposition of the said displaced beams in order to enhance the strength of the signal for small optical path difference values.

33. (Previously Presented) Spectral interferometry apparatus according to claim 29, wherein the means arranged to control the optical path difference and the intrinsic optical delay comprises processing means, and wherein the processing means is arranged to control the displacing means in order to adjust the gap between the relatively displaced object beam and the relatively displaced reference beam in order to alter the minimum optical path difference value for which a modulation of the optical spectrum could be sensed at the reading element.

34. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the object optics further comprises a scanning element, the scanning element being arranged to scan the target object.

35. (Previously Presented) Spectral interferometry apparatus according claim 34, wherein the scanning element is arranged to perform any one of combination of: linear scanning; raster scanning; elicoidal scanning; circular scanning; or any other random shaped scanning.

36. (Previously Presented) Spectral interferometry apparatus according to claim 1, further comprising focusing elements in the object optics to enhance the signal strength from a particular depth within the object.

37. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the interferometer comprises an in-fiber or a bulk interferometer or a hybrid interferometer of in-fiber and bulk components.

38. (Previously Presented) Spectral interferometry apparatus according to claim 1, where the said optical source is a low coherence source.

39. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the said reading element comprises: a photodetector array; a CCD linear array; a two dimensional array of photodetectors; a two dimensional CCD array; or a point photodetector

over which the dispersed spectrum is scanned.

40. (Previously Presented) Spectral interferometry apparatus according to claim 1, further comprising:

beam splitting means arranged to receive the object beam and the reference beam and to produce a second object beam and a second reference beam;

second displacing means arranged to displace at least one of the second object beam and the second reference beam to produce a second relatively displaced object beam and a second relatively displaced reference beam,

second optical spectrum dispersing means arranged to receive the second relatively displaced object beam and the second relatively displaced reference beam on different portions of the second optical spectrum dispersing means due to lateral displacement of the second relatively displaced object beam and the second relatively displaced reference beam caused by the second displacing means, and arranged to disperse the spectral content of the two second displaced beams onto a second reading element such that the dispersed second relatively displaced reference beam and the dispersed second relatively displaced object beam are superposed on the second reading element;

wherein in use the combination of the second displacing means and the second optical spectrum dispersing means is arranged to create a second intrinsic optical delay between the wavetrains of the second relatively displaced object beam and the second relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the second reading element.

41. (Previously Presented) Spectral interferometry apparatus according to claim 40, wherein the second displacing means is adapted to produce the second relatively displaced the second object beam and the second relatively displaced reference beam by using one or a combination of reflection, deflection and refraction of at least one of the second object beam and the second reference beam.

42. (Previously Presented) Spectral interferometry apparatus according to claim 40, wherein the optical spectrum dispersing means and the second optical dispersing means are oriented in such way that in combination with their respective relatively displaced object beam and relatively displaced reference beam, the spectrally dispersed beams from the optical spectrum dispersing means and the second optical dispersing means exhibit intrinsic delays of opposite sign.

43. (Previously Presented) Spectral interferometry apparatus according to claim 42, wherein the reading element is arranged to provide a signal to a signal analyser, the signal analyser being arranged to determine the distribution of reflections or scattering points in a depth range within the target object, and wherein the second reading element is arranged to provide a signal to a second signal analyser, the apparatus being arranged to provide a profile of reflectivity versus optical path difference for the target object covering both signs of optical path difference values on the basis of signals output from the signal analyser and the second signal analyser.

44. (Original) Spectral interferometry apparatus according to claim 42, wherein the second optical dispersing means comprises a diffraction grating or gratings, the diffraction grating or gratings being arranged to diffract orders of opposite sign to the said reading element and the said second reading element.

45. (Original) Spectral interferometry apparatus according to claim 42, wherein the optical dispersing means and the second optical dispersing means each comprises one or more prisms, the one or more prisms being arranged such that the relatively displaced object beam or the relatively displaced reference beam is closest to prism apex in the optical dispersing means and the second relatively displaced reference beam or the second relatively displaced object beam respectively is closest to the prism apex in the second optical dispersing means.

46. (Previously Presented) Spectral interferometry apparatus according to claim 40, wherein a signal output of each of the reading element and the second reading element is sent to

a separate frequency to amplitude converter, the apparatus being arranged such that the output of one frequency to amplitude converter is summed to an inverted output of the other frequency to amplitude converter in order to provide a signal strength proportional to the axial position of a single layer object irrespective of the OPD sign.

47. (Previously Presented) Spectral interferometry apparatus according claim 40, further comprising:

third beam splitting means arranged between the displacing means and the optical spectrum dispersing means, the beam splitting means being arranged to receive the relatively displaced object beam and the relatively displaced reference beam to produce a third relatively displaced object beam and a third relatively displaced reference beam;

third displacing means arranged to adjust the relative displacement of at least one of the third relatively displaced object beam and the third relatively displaced reference beam;

third optical spectrum dispersing means arranged to receive the third relatively displaced object beam and the third relatively displaced reference beam on different portions of the third optical spectrum dispersing means due to lateral displacement of the third relatively displaced object beam and the third relatively displaced reference beam caused by the second displacing means, and to disperse the spectral content displacement of the third relatively displaced object beam and the third relatively displaced reference beam onto a third reading element such that the dispersed third relatively displaced reference beam and the dispersed third relatively displaced object beam are superposed on the third reading element;

wherein in use the combination of the third displacing means and the third optical spectrum dispersing means is arranged to create a third intrinsic optical delay between the wavetrains of the third relatively displaced object beam and the third relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the third reading element.

48. (Previously Presented) Spectral interferometry apparatus according to claim 47, wherein the third displacing means is adapted to adjust the relative displacement of at least one

of the third relatively displaced object beam and the third relatively displaced reference beam using one or a combination of reflection, deflection and refraction of at least one of the third relatively displaced object beam and the third relatively displaced reference beam.

49. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the source is a low coherence source the output of which is send with a delayed replica by means of an optical duplicating element.

50. (Previously Presented) Spectral interferometry apparatus according to claim 49, wherein the optical duplicating element comprises a first single mode coupler whose outputs are connected to two inputs of a second single mode coupler in order to create the delayed replica of the optical source.

51. (Previously Presented) Spectral interferometry apparatus according to claim 49, wherein the displacing means is adapted to relatively orient the relatively displaced object beam and the relatively displaced reference beam in a displacement plane, wherein the optical duplicating element comprises a transparent optical material in the form of a plate with parallel surfaces, which is introduced halfway through into the beam of the optical source in such a way that its edge is parallel to the said displacement plane.

52. (Previously Presented) Spectral interferometry apparatus according to claim 1, wherein the source is a low coherence source comprising a laser driven below threshold.

53. (Previously Presented) A spectral interferometry method, comprising:

outputting an object beam from a target object and a reference beam, wherein the object beam is associated with an object path delay and the reference beam is associated with a reference path delay, the difference between the object path delay and the reference path delay defining an optical path difference;

reflecting, deflecting or refracting at least one of said object beam and said reference beam in order to relatively displace at least one of the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam;

receiving the two relatively displaced beams on different portions of an optical spectrum dispersing means due to lateral displacement of the two relatively displaced beams caused by the relative displace at least one of the object beam and the reference beam to produce the relatively displaced object beam and the relatively displaced reference beam;

dispersing the two relatively displaced beams according to their optical spectral content onto a reading element using the optical spectrum dispersing means such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein the combination of reflecting, refracting or refracting said object beam and said reference beam to produce a relatively displaced object beam and a relatively displaced reference beam and dispersing the two relatively displaced beams using a optical spectrum dispersing means leads to an intrinsic optical delay between the wavetrains in the two relatively displaced beams which can be used with the optical path difference to generate a channelled spectrum for the optical path difference.

54. (Currently Amended) A spectral interferometry method, comprising an interferometer adapted to be excited by an optical source, the interferometer comprising object optics and reference optics, the method comprising:

[[using]] <u>arranging</u> the object optics to transfer a beam from the optical source to a target object, and to produce an object beam from the target object;

[[using]] <u>producing a reference beam with the</u> reference optics ~~to produce a reference beam~~;

[[using]] <u>displacing with</u> displacing means ~~to displace~~ at least one of the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam;

wherein there is an optical path difference between the relatively displaced object beam and the relatively displaced reference beam generated in the interferometer; and

[[using]] arranging optical spectrum dispersing means to receive the relatively displaced object beam and the relatively displaced reference beam on different portions of the optical spectrum dispersing means due to lateral displacement of the two relatively displaced beams caused by the displacing means, and to disperse the spectral content of the two displaced beams onto a reading element_such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein the combination of the displacing means and the optical spectrum dispersing means is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the reading element; and

wherein the displacing means relatively displaces the object beam and the reference beam to produce the relatively displaced object beam and the relatively displaced reference beam using one or a combination of reflection, deflection, or refraction of at least one of the object beam and the reference beam.

55. (Currently Amended) A spectral interferometry method, comprising using an interferometer adapted to be excited by an optical source, the interferometer including object optics and reference optics, the method comprising:

[[using]] arranging object optics to transfer a beam from the optical source to a target object, and to produce an object beam from the target object;

[[using]] producing a reference beam with the reference optics ~~to produce a reference beam~~;

[[using]] displacing with displacing means ~~to displace~~ at least one of the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam;

wherein there is an optical path difference between the relatively displaced object beam and the relatively displaced reference beam generated in the interferometer; and

receiving with optical spectrum dispersing means arranged to receive the relatively displaced object beam and the relatively displaced reference beam on different portions of the

optical spectrum dispersing means due to lateral displacement of the two relatively displaced beams caused by the displacing means, and arranged to disperse the spectral content of the two displaced beams onto a reading element such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein the combination of the displacing means and the optical spectrum dispersing means is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the reading element; and

wherein the object optics includes object fiber optics comprising an object fiber end arranged to transmit the object beam and the reference optics includes reference fiber optics comprising a reference fiber end arranged to transmit the reference beam and the displacing means moves the relative positions of the object fiber end and the reference fiber end in order to produce the relatively displaced object beam and the relatively displaced reference beam.

56. (Currently Amended) A spectral interferometry method according to claim 55, further comprising:

[[using]] producing with the displacing means ~~to produce~~ the relatively ~~displace~~ displaced object beam and the relatively displaced reference beam by a combination of moving the relative positions of the object fiber end and the reference fiber end and any one or combination of reflection, deflection, and refraction.

57. (Currently Amended) A spectral interferometry method, comprising using an interferometer adapted to be excited by an optical source, the interferometer including object optics and reference optics, the method comprising:

[[using]] arranging object optics to transfer a beam from the optical source to a target object, and to produce an object beam from the target object;

[[using]] producing a reference beam with the reference optics ~~to produce a reference beam~~;

[[using]] displacing with displacing means ~~to displace~~ at least one of the object beam and

the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam;

wherein there is an optical path difference between the relatively displaced object beam and the relatively displaced reference beam generated in the interferometer; and

[[using]] <u>receiving with</u> optical spectrum dispersing means ~~to receive~~ the relatively displaced object beam and the relatively displaced reference beam on different portions of the optical spectrum dispersing means due to lateral displacement of the two relatively displaced beams caused by the displacing means, and arranged to disperse the spectral content of the two displaced beams onto a reading element such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein in use the combination of the displacing means and the optical spectrum dispersing means is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the reading element; and

wherein one of the object optics or the reference optics includes fiber optics comprising a fiber end arranged to transmit a respective one of the object beam or the reference beam, and the displacing means produces the relatively displaced object beam and the relatively displaced reference beam by movement of the fiber end.

58. (Currently Amended) A spectral interferometry method according to claim 56, further comprising<u>:</u>

[[using]] <u>producing with</u> the displacing means ~~to produce~~ the relatively displaced object beam and the relatively displaced reference beam by a combination of moving the fiber end and any one or combination of reflection, deflection, and refraction.

59-81. (Canceled)

82. (Currently Amended) A spectral interferometry method according to claim 54, further comprising:

[[using]] receiving with beam splitting means ~~to receive~~ the object beam and the reference beam and to produce a second object beam and a second reference beam;

[[using]] displacing with second displacing means ~~arranged to displace~~ at least one of the second object beam and the second reference beam to produce a second relatively displaced object beam and a second relatively displaced reference beam,

[[using]] receiving with second optical spectrum dispersing means arranged to receive the second relatively displaced object beam and the second relatively displaced reference beam on different portions of the second optical spectrum dispersing means due to lateral displacement of the second relatively displaced object beam and the second relatively displaced reference beam caused by the second displacing means, and arranged to disperse the spectral content onto a second reading element such that the dispersed second relatively displaced reference beam and the dispersed second relatively displaced object beam are superposed on the second reading element;

wherein in use the combination of the second displacing means and the second optical spectrum dispersing means creates a second intrinsic optical delay between the wavetrains of the second relatively displaced object beam and the second relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the second reading element.

83. (Previously Presented) A spectral interferometry method according to claim 82, wherein the second displacing means produce the second relatively displaced object beam and the second relatively displaced reference beam by using one or a combination of reflection, deflection and refraction of at least one of the second object beam and the second reference beam.

84. (Previously Presented) A spectral interferometry method according to claim 82, further comprising orienting the optical spectrum dispersing means and the second optical dispersing means in such way that in combination with their respective relatively displaced object beam and relatively displaced reference beam, the spectrally dispersed beams from the

optical spectrum dispersing means and the second optical spectrum dispersing means exhibit intrinsic delays of opposite sign.

85. (Currently Amended) A spectral interferometry method according to claim 84, further comprising:

[[using]] controlling with processing means ~~to control~~ the optical path difference and the intrinsic optical delay comprises processing means, wherein the second reading element provides a signal to a second signal analyser, the method further comprising providing a profile of reflectivity versus optical path difference for the target object covering both signs of optical path difference values on the basis of signals output from the signal analyser and the second signal analyser.

86. (Previously Presented) A spectral interferometry method according to Claim 82, wherein a signal output of each of the reading element and the second reading element is sent to a separate frequency to amplitude converter, the apparatus being arranged such that the output of one frequency to amplitude converter is summed to an inverted output of the other frequency to amplitude converter in order to provide a signal strength proportional to the axial position of a single layer object irrespective of the OPD sign.

87-89. (Canceled)

90. (Previously Presented) A spectral interferometry method according to claim 85, further comprising arranging the signal analyser and the second signal analyser in such a way that only two main peaks are retained in total in the accumulated signal output of the signal analyser and the second signal analyser, and determining the thickness of the object on the basis of the difference between the maximum and minimum frequency of the two peaks arising at the output of one of the signal analyser and the second signal analyser when no other signal exceeds a threshold at the output of the other of the signal analyser and the second signal analyser.

91. (Previously Presented) A spectral interferometry method according to claim 85, further comprising arranging the signal analyser and the second signal analyser in such a way that only two main peaks are retained in total in the accumulated signal output of the signal analyser and the second signal analyser, and determining the thickness of the object on the basis of the sum of the extreme frequencies of the signal analyser and the second signal analyser when the signal exceeds a threshold only once in the output of each of the signal analyser and the second signal analyser.

92. (Previously Presented) A spectral interferometry method according to claim 90 or 91, further comprising using a thresh-holding circuit mounted at the output of each of the signal analyser and the second signal analyser to discard non-essential peaks which represent noise and peaks from the target object of smaller amplitudes in such a way that only two main peaks are retained in total in the accumulated signal output of the signal analyser and the second signal analyser.

93. (Previously Presented) Spectral interferometry apparatus, comprising an interferometer adapted to be excited by an optical source, the interferometer comprising:

a first optical path leading from the interferometer to a target object;

a second optical path leading a reference light beam to displacing means;

interface optics adapted to transfer an optical beam from the optical source to the target object along the first optical path, to transfer an optical output beam from the target object back to the interferometer along the said first optical path, and to transfer said optical output beam along a third optical path to the displacing means to produce an object beam;

reference optics adapted to transfer the reference beam to the displacing means along the said second optical path;

the displacing means being adapted to reflect the object beam and the reference beam in order to relatively displace the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam, wherein there is an optical path difference between the relatively displaced object beam and the relatively displaced reference beam generated in the interferometer;

optical spectrum dispersing means adapted to receive the relatively displaced object beam and the relatively displaced reference beam on different portions of the optical spectrum dispersing means due to lateral displacement of the two relatively displaced beams caused by the displacing means, and to disperse the spectral content of the two beams onto a reading element such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein in use the combination of the displacing means and the optical spectrum dispersing means is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference in the interferometer to generate a channelled spectrum for the optical path difference in the interferometer on the reading element; and

processing means adapted to control the optical path difference between the relatively displaced object beam and the relatively displaced reference beam in the interferometer as well as the intrinsic optical path difference between the same beams.

94. (Previously Presented) Spectral interferometry apparatus, comprising

object optics arranged to transfer a beam from the optical source to a target object, and to produce an object beam from the target object;

reference optics arranged to produce a reference beam, wherein the object beam is associated with an object path delay and the reference beam is associated with a reference path delay, the difference between the object path delay and the reference path delay defining an optical path difference;

displacement optics arranged to displace at least one of said object beam and said reference beam in order to relatively displace at least one of the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam, wherein the displacement optics is arranged to use one or a combination of reflection, deflection, or refraction of at least one of the object beam and the reference beam;

optical spectrum dispersing optics arranged to receive the relatively displaced object beam and the relatively displaced reference beam on different portions of the optical spectrum dispersing optics due to lateral displacement of the two relatively displaced beams caused by the

displacement optics, and arranged to disperse the spectral content of the two displaced beams onto a reading element such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein in use the combination of the displacement optics and the optical spectrum dispersing optics is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference to generate a channelled spectrum for the optical path difference on the reading element.

95. (Previously Presented) Spectral interferometry apparatus, comprising:

object optics arranged to transfer a beam from the optical source to a target object, and to produce an object beam from the target object;

reference optics arranged to produce a reference beam, wherein the object beam is associated with an object path delay and the reference beam is associated with a reference path delay, the difference between the object path delay and the reference path delay defining an optical path difference;

displacing means arranged to displace at least one of the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam;

optical spectrum dispersing optics arranged to receive the relatively displaced object beam and the relatively displaced reference beam on different portions of the optical spectrum dispersing optics due to lateral displacement of the two relatively displaced beams caused by the displacing means, and arranged to disperse the spectral content of the two displaced beams onto a reading element such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein in use the combination of the displacing means and the optical spectrum dispersement optics is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference to generate a channelled spectrum for the optical path difference on the reading element; and

wherein the object optics includes object fiber optics comprising an object fiber end

arranged to transmit the object beam and the reference optics includes reference fiber optics comprising a reference fiber end arranged to transmit the reference beam and the displacing means is arranged to move the relative positions of the object fiber end and the reference fiber end in order to produce the relatively displaced object beam and the relatively displaced reference beam.

96. (Previously Presented) Spectral interferometry apparatus according to claim 95, wherein the displacing means is further arranged to produce the relatively displaced object beam and the relatively displaced reference beam by a combination of moving the relative positions of the object fiber end and the reference fiber end and any one or combination of reflection, deflection, and refraction.

97. (Previously Presented) Spectral interferometry apparatus according to claim 95, wherein moving the object fiber end or the reference fiber end further comprises also moving an object fiber end collimator associated with the object fiber end and/or moving an reference fiber end collimator associated with the reference fiber end.

98. (Previously Presented) Spectral interferometry apparatus, comprising

object optics arranged to transfer a beam from the optical source to a target object, and to produce an object beam from the target object;

reference optics arranged to produce a reference beam, wherein the object beam is associated with an object path delay and the reference beam is associated with a reference path delay, the difference between the object path delay and the reference path delay defining an optical path difference;

displacement means arranged to displace at least one of said object beam and said reference beam in order to relatively displace at least one of the object beam and the reference beam to produce a relatively displaced object beam and a relatively displaced reference beam;

optical spectrum dispersing optics arranged to receive the relatively displaced object beam and the relatively displaced reference beam on different portions of the optical spectrum dispersing optics due to lateral displacement of the two relatively displaced beams caused by the

displacement optics, and arranged to disperse the spectral content of the two displaced beams onto a reading element such that the dispersed relatively displaced reference beam and the dispersed relatively displaced object beam are superposed on the reading element;

wherein in use the combination of the displacement means and the optical spectrum dispersing optics is arranged to create an intrinsic optical delay between the wavetrains of the two relatively displaced object beam and the relatively displaced reference beam which can be used with the optical path difference to generate a channelled spectrum for the optical path difference on the reading element;

wherein one of the object optics or the reference optics includes fiber optics comprising a fiber end arranged to transmit a respective one of the object beam or the reference beam, and the displacing means is arranged to produce the relatively displaced object beam and the relatively displaced reference beam by movement of the or each fiber end.

99. (Previously Presented) Spectral interferometry apparatus according to claim 98, wherein the displacing means is further arranged to produce the relatively displaced object beam and the relatively displaced reference beam by a combination of moving the or each fiber end and any one or combination of reflection, deflection, and refraction.

100. (Previously Presented) Spectral interferometry apparatus according to claim 99, wherein moving the or each fiber end further comprises also moving a collimator associated with the or each fiber end.